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2008 PORTUGUESE TOBACCO LAW: WHAT ARE THE EFFECTS ON SMOKING RATES?

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ABSTRACT

In 2008, Portugal implemented a smoking ban, restricting smoking in workplaces and indoor public places. The aim of this study is to understand whether there was any effect in smoking prevalence due to the ban. Using the 4th Portuguese National Health Survey and an online survey collected in 2012, designed for this project, a *probit* model was estimated. The conclusions were that, so far, the ban seems to have been unable to counteract an apparent increase in young adult smoking. Young adult smokers are characterized by starting at an older age (18 years old) and being mainly light smokers (78%).

Keywords: Smoking Ban, Portugal, Smoking Prevalence, Young Adult Smoking.

1. INTRODUCTION

According to the most recent numbers of the World Health Organization, tobacco is responsible for nearly 6 million deaths per year around the world. It represents one of the world's biggest epidemics and a major public health threat (WHO, 2012). Europe has one of the highest shares of tobacco attributable deaths - 16% compared to a global average of 12% (WHO, 2011). In Portugal, according to Borges et al. (2009), 12,000 people die every year due to tobacco smoking (data from 2005).

Secondhand smoke (SHS) is not free from risks as well. Even though evidence that SHS is harmful for the health of nonsmokers is relatively recent (DGS¹, 2007), it has become broadly accepted. SHS is responsible for more than 600,000 deaths worldwide per year (Öberg et al., 2010), 79,000 deaths in the EU (European Agency for Safety and Health at Work) and 1,500 in Portugal (The Smoke Free Partnership, 2006). With his literature review Calheiros (2006)

¹ Direcção Geral de Saúde

collected evidence that someone who has never smoked has 24% higher chance of having lung cancer if he lives with a smoker rather than with a nonsmoker.

A survey collected by Kapiainen (2011) displays arguments used to justify government intervention in tobacco markets: SHS consequences to non-smokers, increase in health costs, consumer's imperfect information in what regards the addictive nature of tobacco consumption and its health effects, the desired of the majority of smokers to quit, productivity loss, the need to change social norms, among others. There is a great amount of research that intent to understand the impact of tobacco regulation² on various outcomes, from number of cigarettes smoked per day to quit rates. In this present study, the focus will be on the effects of a smoking ban on smoking rates.

Rhoads (2011) was one of the few who studied the effects of comprehensive state tobacco control programs, at the national level (U.S.), on adult smoking, concluding that smoke-free air laws have negative impact on both smoking prevalence and number of cigarettes smoked. Farkas et al. (2008) analyzed U.S. population surveys (48,584 individuals), concluding that those who live or work under total smoking bans are more likely to attempt quitting, stay quit and be light smokers.

Since 1959, several laws have been enacted in Portugal with the aim of protecting citizens who are involuntarily exposed to SHS (Fraga et al., 2005). The most recent one, in place since 1st January 2008, imposed restrictions on smoking in closed spaces destined to collective usage, such as workplaces, restaurants and bars; implemented rules regarding composition of substances in the cigarettes, packaging, sale and publicity. It also enforced measures in the

² Such as smoking bans, anti-tobacco advertisement, plain packaging, taxes, among others.

field of prevention and control of tobacco use, with a special focus on education in schools and specialized smoking cessation services³.

Since 2004, European countries have been adopting laws prohibiting smoking in indoor public places and workplaces, and currently all member states have some form of regulation (EPHA, 2012). Ireland was the first country to implement a total smoking ban in March 2004. Fong et al. (2006) conducted a phone survey before and after the ban in a representative sample of adult smokers, and reported an increased support for total bans after it was enacted, a decrease in smoking occurrence in workplaces, restaurants and bars/pubs as well as a general feeling that the law help quit smoking or stay quit. Gorini et al. (2007) and Heloma et al. (2001) studied the impact of smoking bans in Italy and Finland (respectively), also concluding that there was a decrease in smoking prevalence⁴. Anger et al. (2010) studied the German smoking ban enacted in 2007-2008 using data from the German Socio-Economic Panel Study. They concluded that even though the ban had no effect on the smoking behaviour of the population as a whole, it decreased smoking prevalence in some specific cohorts. Guerrero et al. (2011) studied the 2006 Spanish smoke-free law using data from the Spanish Ministry of Health and Social Policy. They found that the number of smokers in fact decreased upon implementation of the law, but in the following three years it returned to its previous value, having no effect on the new smokers.

During six months shortly after the implementation of the Portuguese smoking ban, Cardoso and Plantier (2008) conducted a survey of 6,308 individuals in five regions of Portugal,

³ Decreto-Lei number 37/2007.

⁴ Gorini et al. (2007) studied the Italian smoking ban (enacted in 2005) by conducting a literature review between 2004 and 2006. They report a decrease in smoking prevalence (by 7.3%) and cigarettes sales (by 6.1%), increased support and respect for the law and better quality of air (drop in concentration of environmental nicotine in pubs and discos). Heloma et al. (2001) conducted surveys and indoor air nicotine measurements in nine Finnish workplaces, concluding that the workplace legislation implemented in 1994-1995 not only decreased SHS but also tobacco consumption.

concluding that 5% quit smoking and 22% decreased consumption⁵. Similarly, Nogueira et al. (2011) elaborated a report based on all the published information on tobacco, in Portugal, between 2007 and 2010. In the same line of the previous findings, they concluded that the Law is approved by the majority, is recognized as a mechanism to change smoking habits, improving health status, quality of air and protecting non-smokers. Stressing that the studies were not conclusive, they identify a decreasing trend in tobacco consumption⁶.

The aim of the present study is then to continue the research on the impact of the 2008 Portuguese Smoking Ban, specifically on its possible effects on smoking prevalence.

2. DATA

This study is based on two datasets: the 4th Portuguese National Health Survey (from now on referred as the 2005 survey or the NHS) and a survey collected online between October and November 2012 (from now on referred as the 2012 survey).

The 4th NHS was carried out between February 2005 and February 2006 by the *Instituto Nacional de Estatística* and the *Instituto Nacional de Saúde Doutor Ricardo Jorge*. Information on 41,193 individuals was collected, from newborns to 102 years old. The questions are divided in six main areas: socioeconomic and demographic characteristic, health status, health care and prevention, lifestyles, quality of life and food security. Regarding smokers and ex-smokers, they can be of three types: daily, occasional, or never smokers. The aim of this project is to model smokers and their characteristics and, as such, occasional, or as also known as, social smokers, were dropped from the 2005 sample. Similarly, in the case of

⁵ They also found that the majority of the inquired believes that the Law protects the health of the population; 35% stated improvements in own health; and 78% considered that the Law is being fully or moderately respected. It was also observed an increase of smoking cessation services of 60% between 2007 and 2008.

⁶They also present evidence of decreasing tobacco consumption inside home after the implementation of the Law, and adjustment of smokers to decrease non-smokers' exposure. According to this study, one of the goals of the Law – to change social norms regarding tobacco consumption – is being achieved.

quitters, the goal is to assess whether the Law has had an impact in their decision and, as such, occasional ex-smokers were also dropped from the sample⁷. Observations for individuals with less than ten years old were also dropped from this sample since they did not answer the tobacco related area of the survey.

The 2012 survey was collected online and constructed to mirror as much as possible the NHS, so that the variables would be comparable. However, since the latter is constituted by around 400 questions, to perfectly replicate it would be unfeasible for an online survey with a two-month span, and consequently only the most important variables were kept⁸. Since the goal is to predict changes in smoking behaviours by using a *probit* model for smokers, the data collected covers variables that work not only as controls but also might influence the probability of being a smoker: socioeconomic factors and smoking environment and habits⁹. 2,641 people answered the survey and, once again, occasional smokers and ex-smokers, as well as individuals below 10 years old were dropped, reaching a final sample of 1,802 individuals.

3. METHODOLOGY

The aim of this study is to understand the effects on smoking rates that can be attributed to the 2008 Portuguese Tobacco Law. More specifically, whether there has been a change in the probability that an individual is a smoker. The most accurate way to detect this would be to

⁷ There is no intent, however, of disregarding the dangers and consequences of being an occasional smoker: another field that could have been explored in this project and has been by other authors (Husten et al., 1998; Hassmiller et al., 2003; Moran et al., 2004; among others).

⁸ The questions in this survey were collected from other works: Hymowitz et al. (1997); Tauras and Chaloupka (1999); Biener et al. (2010); Anger et al. (2010); among others.

⁹ Socioeconomic factors comprise gender, age nationality, marital status, schooling, occupation, region of residence, relation with the people the individual shares house with, height and weight, health insurance, chronic diseases, prescription drugs and income. Smoking environment variables account for whether the individual lives with a smoker and/or ex-smoker. Smoking habits variables were also included for smokers and ex-smokers: number of cigarettes smoked per day, since when the individual smokes and (in case it applies) when was he/she quit, number of quitting attempts, reason for quitting, whether the smoking ban had help them quit and/or stay quit. Finally, questions about changes in smoking habits due to the ban and the crisis were also asked. More information on the variables and copy of the survey can be found in S.Appendix 1 and 2 (S.Appendix stands for Supplementary Appendix).

interview individuals before and after the shock (2008 Portuguese Tobacco Law), collecting as many variables as possible. Assuming that the shock occurs at time t , interviews should be conducted at $t-1$ to a representative sample. A model should then be constructed, aiming at capturing the characteristics that influence the probability of an individual being a smoker. As such, the type of model to be used would be a *probit*, with the binary dependent variable being *smoker*¹⁰. This model would be the representation of the **behaviours** of the inquired before the shock.

The same variables about the *same* individuals should be collected in $t+1$. To check whether there has been any change in smoking behaviour, the coefficients found by the model in $t-1$ should be applied to the variables collected in $t+1$, and the probability of being a smoker should be predicted – this step is basically “applying” the observed behaviour in $t-1$ to the individuals in $t+1$. The resulting prediction should then be compared with the reality. Given that individuals are the same and everything is controlled for between the two time periods, except for the shock, in case prediction matches reality, we can infer that no changes in individual behaviour happened between $t-1$ and $t+$. In case predictions do not match reality, individuals are no longer behaving as in $t-1$ and the adjustment the shock pursuits have occurred.

Unfortunately, a database that comprises questions for the same individuals before and after the Law is not available and, therefore, an approximation will be used by substituting individual observations in times $t-1$ and $t+1$ by two different surveys: the 4th National Health Survey 2005/2006 and the 2012 survey, respectively.

In summary, the three-step methodology applied in this analysis will be as follows: a) Construct a model that estimates the probability of an individual being a smoker based on the

¹⁰ And also controlling for macroeconomic variables such as inflation, unemployment, tobacco prices, among others.

NHS; b) Apply the coefficients found previously to the 2012 sample by predicting the probability that individual i is a smoker and analyse whether the predictions were correct; c) Analyse deviations of predictions from reality in order to characterize who has changed.

a. Construction of the model and application

Since the aim of this model is prediction rather than capturing the significant effects of the various characteristics on the probability of i being a smoker, it will contain all the variables collected in the 2012 survey (that are also present in the NHS), whether they are significant or not. As such, the 51-variable model to be studied - referred from now on as ‘the model’ - is the following:

$$\Pr \text{ smoker}_{it} = \beta + \gamma \text{ SocioEconomic Factors}_{it} + \lambda \text{ Smoking Environment}_{it}$$

The socioeconomic factors include **gender**, **age**, **nationality**, **marital status**¹¹, **number of people** the individual shares house with, **years of schooling** and **highest educational degree achieved**, **occupation**, two binary variables for monthly **income** intervals, **living place** (by NUTs), **height and weight**, whether the individual has **health insurance**, fifteen binary variables for the presence of **chronic diseases**, and a binary variable for whether the individual took any prescription **drugs** in the last two weeks. Smoking environment variables include dummies for whether the individual **lives with a smoker and/or an ex-smoker**, a variable that indicates the **number of years** individuals have been smoking for¹², and a binary variable for whether the individual was a **smoker five years prior** to the survey date.

¹¹ Also include the binary variable for living conjugally with someone.

¹² If the aim of the model were to estimate the probability of an individual being a smoker, this last variable could not be used, due to the problem of causality: by simply taking the value of zero for never smokers, the variable would indicate that the person most likely is not a smoker. However, since the final goal of the model is to predict whether an individual in another sample is a smoker, the causality problem becomes negligible due to the retrospective nature of this process.

Only ten of the 51 variables and the constant are statistically significant at a 5% level: age, student, the binary variable for the interval of 151€ and 250€ monthly income, binary variable for having health insurance, the binary variables for depression and infarction, living conjugally with someone, living with a smoker, the binary variable for whether the individual was a smoker five years prior to the survey, and the number of years the individual as smoked for¹³. While the sign of some statistically significant variables is according to the literature, some non-significant variables should be significant, even though evidence on which variables affect the probability of being a smoker is not consistent¹⁴.

Analyzing the predictive power of the model, we can conclude that it overestimates the smokers: there are 17.78% smokers in the 2005 sample and the model predicts 20.93%. This deviation from reality can stem from two types of errors: the model wrongly predicts the smokers (we will call this errors of type A1 or A1 predictions) and/or the model wrongly predicts the non-smokers (error type B1). In 2005, 5.33% of the predictions are errors of type A1 and 1.63% of type B1¹⁵, which illustrates a fairly accurate model for 2005.

Now that the model is constructed and its predictive power is checked, we can apply its coefficients to the 2012 sample, by predicting the probability that each individual is a smoker.

b. Analysis of prediction

In the 2005 sample, **17.78%** of the individuals are smokers (6,362 out of 35,778). Using the model and predicting for the 2012 sample, if there had been no changes between 2005 and 2012, the smoking prevalence would be **9.49%** (**171** smokers out of 1,802). However, the real smoking rate for 2012 is **30.97%** (**558** out of 1,802 individuals are smokers).

¹³ Table 1 in Appendix. Marginal effects can be found in S.Appendix 3.

¹⁴ For comparisons of the effects with the literature, check S.Appendix 4.

¹⁵ In other words, of the predicted 2005 non-smokers, 5.33% were smokers. Similarly, of the predicted 2005 smokers, 1.63% were, in fact, non-smokers.

Trough prediction, we can make a filter of the individuals who were correctly predicted and those who were not. Of the 1244 non-smokers in the 2012 sample, 1230 (98.87%) were correctly predicted by the model, leaving 1.13% of the predictions to be wrong - type B2¹⁶ errors, the 2012's counterpart of errors type B1. Regarding smokers, there is no such accuracy. Of the 558 smokers, only 157 (28.14%) were correctly predicted, resulting in 401 individuals (71.86%) that are predictions of type A2 (the 2012's counterpart of type A1). This analysis shows us that the difference between 2005 and 2012 lies in the prediction of smokers.

Having a considerable share of A2 predictions does not come as a surprise: A1 errors were already higher than B1 errors and, therefore, we should be expecting some kind of lack of precision when predicting smokers. However, even though the model presents 5.33% predictions that are errors of type A1, type A2 errors increase almost fourteen-fold – an increase that cannot be solely explained by the normal lack of accuracy that econometric models carry. We must then understand who exactly these type A2 individuals are and how they behaved in 2005.

There are two possible outcomes. The first hypothesis is that A2 individuals were already different in 2005, and the reason such large error exists is due to the fact that the model could never correctly predict them – this group will be called the '**Wild smokers**'. The second hypothesis is that the behaviour of individuals followed the model in 2005 but, since then, something has changed that made them become smokers –the '**New smokers**'¹⁷.

Recalling that the two types of individuals described above are smokers that were predicted not to be, we still need to define two other types of smokers: those who were correctly predicted by the model - the '**Old smokers**' and the '**Late smokers**'. The first group is

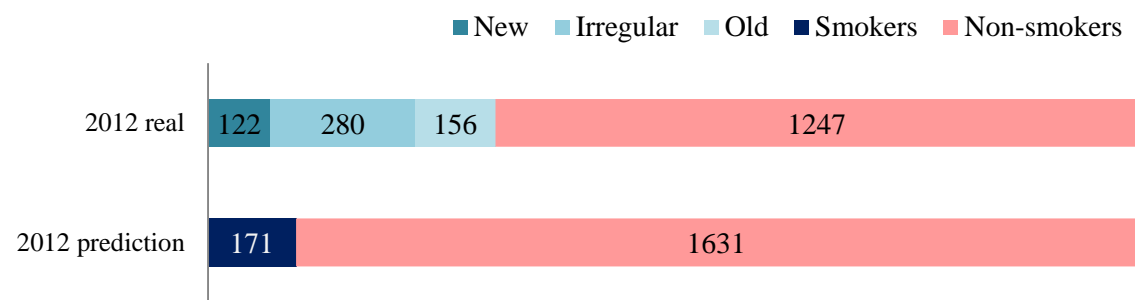
¹⁶ Table 2 in Appendix

¹⁷ Table 3 in Appendix

constituted by individuals that were already smokers in 2005 and the model correctly predicted their behaviour. The second group, the ‘Late smokers’, are those who did not smoke in 2005 and, therefore, the model wrongly predicted them as smokers – they can be viewed as a kind of ‘Wild smoker’, whose behaviour always failed to be modeled. We can then join the ‘Wild’ and ‘Late’ in a group of **‘Irregular’ smokers**.

To summarize, there are 122 ‘New smokers’, which represent **22%** of 2012’s smokers; there are 280 ‘Irregular smokers’, representing **50%** of the 2012’s smokers and 156 ‘Old smokers’, accounting for **28%**. In graph 1 we can easily visualize the difference between the reality of 2012 and the prediction.

Graph 1: Real and predicted 2012 population by type of smokers and non-smokers



The second step is therefore complete: after predicting for the 2012 sample, we checked whether it was accurate and found out that there exist some deviations. We can now move to the third step where we will try to characterize the individuals that have apparently changed. Studying the characteristics of ‘Irregular smokers’ will not provide much information: those individuals are the ones who did never behaved like modeled and, as such, their ‘change’ in behaviour can never be attributed to the Tobacco Law, but instead to other factors that is not the aim of this study to explore. The group of interest is, therefore, the ‘New smokers’. They will be described by comparison with the ‘Old smokers’, the 2012 and 2005 populations and the 2012 and 2005 overall smokers.

4. RESULTS

c. Analysis of deviations¹⁸

Socioeconomic Factors

Age - The average age for the whole sample in 2005 is 46 years old, being the 2005 smokers 5 years younger. In the whole 2012 sample the average age is 26 years old, while for the ‘Old smokers’ it is 29 and for the ‘New smokers’ 20 years old.

Gender - In the 2005 sample, 47% of the individuals are male and this share increases to 74% when looking at the 2005 smokers. The higher prevalence of smokers among men is not translated in the 2012 sample: of the 558 smokers, only 43% are male (40% of the surveyed individuals in 2012 are men).

Marital Status - This variable is divided in five categories: single, married, divorced, widowed and other. In the 2005 sample, 30% of the individuals are single, 56% are married, 4% divorced and 9% widowed. The 2005 smokers follow almost the same distribution for single and married, presenting, however, a higher share of divorced. The 2012 sample shows a very different distribution, for which the main explanation is likely to be the lower average age: nearly 82% of the individuals in 2012 are single, compared to 78% of smokers and a great increase to 97% of ‘New smokers’. This difference might again be due to the fact that ‘New smokers’ are younger. For the same reason as previously pointed out, we also observe 11% of married individuals in the 2012 sample and none in ‘New smoker’s sample. We should also note that while divorced individuals account for 4% of the 2012 sample, they do represent a higher share in the ‘Old smokers’ (6%).

¹⁸ Detailed characteristics of each group in Table 4 in Appendix.

Studies - This variable represents the educational degree the inquired are currently attending or the highest they have achieved, in case they no longer study. It is divided in three categories: basic (until the 9th grade), secondary (until 12th grade or similar) and tertiary (higher education). In 2005, 76% of the individuals reached or are currently attending basic education, 13% secondary and 9% tertiary, being the average years of schooling 7.46. 2005 smokers present a similar distribution, leaning, however, towards more education¹⁹. Education distribution in 2012 overall sample is the opposite: 2% basic, 14% secondary and 84% tertiary. All types of 2012 smokers present less education than the overall 2012 sample, being ‘Old smokers’ the least educated group. 77% of the ‘New smokers’ attended or are currently attending higher education.

Occupation - The majority of the inquired in 2005 are workers (47%) followed by retired (22%). 70% of 2005 smokers work and 10% are retired – an expected effect due to the different average age of the cohorts. Nearly 60% of the 2012 sample and 50% of the smokers are students. Once again, in line with the fact that the ‘New smokers’ are younger than the average, 85% are students compared to only 20% of ‘Old smokers’, the group presenting the highest share of workers (49% compared to 27% in the overall sample).

Region²⁰ - This variable stands for the area of Portugal where the individual lives, and is divided in the seven NUTs (Nomenclature of territorial units for statistics). The purpose of the NHS was to convey a representative sample of the country and, as such, the distribution among the NUTs is constant (approximately 14% per NUT). We can verify higher shares of smokers in *LVT*²¹, *Algarve* and *Açores* (16% and 18% for the latter) and a lower share in *Centro* and *Norte* (10% and 13%). In terms of the 2012, no such accuracy in sampling could

¹⁹ 7.98 years of schooling on average.

²⁰ Check S.Appendix 6.

²¹ *Lisboa e Vale do Tejo*

be met, and the distribution is as follows: *Norte* (6%), *Centro* (15%), *LVT* (72%), *Alentejo* (4%), *Algarve* (2%), *Região Autónoma dos Açores* and *Região Autónoma da Madeira* (1%). Taking only into consideration *Norte*, *Centro*, *LVT* and *Alentejo* for comparisons (since the sample in the other regions is small), the share of 2012 smokers in all regions is always higher than in 2005. *Alentejo* presents the highest share of ‘New Smokers’, whereas *Norte* presents the lowest.

House - This variable is not available for 2005 and so we can only analyse the 2012 sub-groups. Whichever sample we analyse, the majority of the individuals live with their family (from 62% to 76% - the latter is observed in the ‘New smokers’ group, an expected result given, once again, the lower average age of this cohort). There is however a significant difference concerning living with a partner and friends for overall sample and the ‘New smokers’: the 2012 population shows rates of 15% and 12%, respectively, whereas the ‘New smokers’ present shares of 2% and 18%. None of the ‘New smokers’ lives alone, compared to 10% of the 2012 population that lives alone.

Income - The variable income is divided in 10 intervals, the first representing monthly income lower than 150€ and the highest more than 2000€. All the groups in both years show an average between 8 and 9 (1201€ to 2000€), with the exception of the overall sample of 2005 and ‘Old smokers’, presenting an average income of 7.99 and 7.97 respectively.

Health - 2005 sample presents more chronic diseases than 2012’s. The pattern concerning smokers differs: 2005 smokers have less chronic diseases than 2012’s. 27% of the 2012 population has one or two chronic diseases and 2% has more than two. This distribution is fairly similar for the ‘New smokers’. ‘Old smokers’ are the ones who present more diseases in 2012 sub-samples: 35% declares having one or two diseases and 7% to have more than two diseases. Contrarily to what it would be expected, given this disease’s distribution, only 44%

of them has taken prescription drugs in the last two weeks comparing to 51% of the overall sample and 59% of the 'New smokers'.

Smoking Environment & Habits

Living with a smoker - In 2005, 32% of the population lives with a smoker compared to only 20% in 2012. That number escalates to 44% when looking at 2005 smokers and to 57% when looking at 2012 smokers. In the 'New smokers' sample the share increases slightly to 57% and to 67% in the 'Old smokers' group.

Living with an ex-smoker - 23% of the 2005 population shares house with an ex-smoker, a share that decreases to 19% when considering only 2005 smokers. 13% of the individuals in the 2012 sample share house with ex-smokers. We can observe once again an increase when looking at 'New smokers' (38%), but this time a relative decrease when comparing to 'Old smokers' (26%).

Starting age - Regarding current smokers, the average starting age is 17.03 years old in 2005 and 16.83 years old in 2012. However, there is a significant difference in starting age between 'Old' and 'New' smokers: 17.84 and 14.75 respectively. In the first group, 92% start smoking before they reach 17 years old while in the second only 51% start before 17 years old.

Number of cigarettes - 2005 smokers consume an average of 33 cigarettes daily whereas 2012 smokers consume only 12 cigarettes per day. Comparing sub-groups of 2012 smokers, the numbers also diverge: 9 cigarettes in the sub-sample of 'New smokers' and 12 cigarettes in the 'Old smokers' sample. 78% of 'New smokers' are light smokers²², compared to 53% of

²² There are no clear standards to classify light, average and heavy smokers. In order to systematize, it was chosen the classification suggested by Health Canada. Light smoker is defined as smoking 10 or less cigarettes per day; average smoker is defined as smoking 11 to 19 cigarettes per day; heavy smoker is defined as smoking 20 or more cigarettes per day.

‘Old’ light smokers. Average smokers account for 15% and 26%, respectively and heavy smokers represent 7% and 21%, respectively.

Quitting attempts - 46% of the 2005 smokers and 52% of the 2012 smokers have attempted to quit at least once. That percentage is rather similar for the ‘Old’ smokers (55%), decreasing to 43% in ‘New smokers’. Accordingly, 5% of 2012 smokers went to a smoking cessation appointment whereas none of the ‘New smokers’ have done so.

Before drawing any further conclusions, it is important to be sure that the apparent change in behaviour does not stem from differences between the samples. One possible method to check the comparability and rule out any possible bias is to look at specific cohorts²³ and apply the same methodology as before. The conclusions are very similar from above: type A1, B1 and B2 errors always account for less than 7%, whereas type A2 predictions are never less than 36%²⁴. This suggests that, even though 2005 and 2012 samples present key differences, they can be compared.

It is useful to characterize the ‘New smokers’ by their most divergent characteristics in order to understand their distinctive features. ‘New smokers’ are young, single, university students that live mostly with their families and also with their friends, presenting no differences between males and females. They have less chronic diseases than the average population but a higher share of them takes prescription drugs and has health insurance, which might indicate a more pronounced concern about their own health than the rest of the population. ‘New smokers’ start smoking later and are essentially light smokers. Comparatively to the other

²³ **Men, women, lighter smokers, students** and five **age cohorts**. In the case of the students group, random observations from 2005 in this last group were dropped so that the 2005 student sample would have the same income distribution as the 2012 student sample – S.Appendix 7. In the case of lighter smokers, random observations were dropped in order to achieve two goals: i) to equal the average number of cigarettes smoked in 2005 to the average number in 2012 and ii) to equal the 2005 distribution of years of schooling to the 2012’s

²⁴ Table 5 in Appendix

cohorts, a great share of them lives with ex-smokers and few have attempted to quit. None of them was a smoker before the Law was implemented.

Applying the same rationale to ‘Old smokers’, they are older, less educated and present the highest share of divorced people and workers among all 2012 groups. They exhibit more chronic diseases than average but are the group which has the lowest share of people taking prescription drugs or having health insurance. Most of them live with other smokers, start smoking at an earlier age, smoke more cigarettes per day than average. All the ‘Old smokers’ were already smokers before 2008.

5. DISCUSSION & CONCLUSIONS

There are many studies – Portuguese and international - regarding smoking patterns and policy implications in Portugal. Very few of them, however, focus on young adult smoking, being adolescent and general population smoking the most studied phenomena (Precioso et al., 2009; Hibell et al., 2011, among many others). This present study is one of the few recognizing a growing trend of young adult smoking in Portugal, alerting for the fact that just because an individual does not smoke until the end of adolescence, that does not mean that he or she will not be a smoker in the future.

Research on this topic was also conducted by, for instance, Santos and Barros (2003), who interviewed 1,644 individuals, revealing a smoking rate of 51% for individuals between 18 and 29 years old, the highest smoking rate of all age cohorts. Precioso (2004) surveyed 338 students in Universidade do Minho, Portugal, concluding that 29% started to smoke when entered university²⁵. His findings contradict the belief expressed by many authors that if an

²⁵ One of the suggestions given by the author to counteract this high share of young adult smokers is the creation of smoke-free Universities, measure that was imposed years four after his study, but according to the present research, did not bear the abovementioned effect.

individual does not start to smoke until the end of adolescence, he or she will hardly be a smoker. Steptoe et al. (2002) surveyed 19,298 seventeen to 30 year-old college students from 23 European countries, concluding that the smoking rate among Portuguese young adults was one of the highest (44% for men and 42% for women). Rise in young adult smoking rates was observed in Europe, between 1990 and 2000 (Steptoe et al., 2002b). Similarly, Hammond (2005) and Lantz (2003), analyzed national surveys from Canada and the U.S., respectively, providing evidence of increased smoking rates among young adults.

Why is young adult smoking increasing?

i) Cohort effect - One of the hypotheses that could explain the increase in young adult smoking would be the rise of adolescent smoking. However, according to data from ESPAD and INME²⁶ (Hibell et al., 2011 and Feijão, 2011), a decreasing smoking trend among younger cohorts was observed from 1999 to 2007, followed by a rise in 2011²⁷. Secondary students of 1999 are 2005's young adults. Similarly, secondary students of 2007 are nowadays' young adults. As such, if cohort effect would be the sole cause of young adult smoking, the share of young smokers in 2005 would be higher than the share in 2012. Such pattern, according to the NHS and the 2012 survey, is not observed²⁸. Adolescent smoking might then be a driver of young adult smoking, but it is unlikely its only source.

'New smokers' may also be a delayed effect of the Law enacted in 1983, which forbids smoking in places destined to people younger than 16 years old (Fraga et al., 2005). Their recent change in behaviour might be a late consequence of this prohibition combined with

²⁶ ESPAD (European School Survey Project on Alcohol and Other Drugs) 1999, 2003, 2007 and 2011 – an European project which goal is to collect data on substance use among 15 and 16 year-old European students and therefore monitor trends between and within countries; INME (*Inquéritos Nacionais em Meio Escolar*) 2001, 2005 and 2011, promoted by the Portuguese Institute of Drugs and Addictions (I.D.T.), which aims at describing the consumption of psychoactive substances in students of the 3rd cycle (7th to 9th grade – 13 to 15 years old) and secondary education (10th to 12th grade – 16 to 18 years old).

²⁷ Graph 2 in Appendix.

²⁸ Smoking rates for the population between 18 and 24 years old are, respectively 27% and 29%.

lags in its enforcement and compliance. The 2008 Tobacco Law also increased the minimum required age to buy tobacco from 16 to 18 years old. It is possible that ‘New smokers’ are only shifting their starting age, but are, nevertheless, smokers.

ii) Marketing - Ling et al. (2002) collected roughly 200 tobacco industry documents, concluding that tobacco marketing plays a crucial role in young adult smoking initiation. They affirm that cigarette advertisement explores the life changes that happen in young adulthood by integrating smoking in the places and new activities those individuals engage (such as leaving home, going to university, getting a job or going to bars). According to the Tobacco Control Scale (Joossens and Raw, 2011), Portugal is below the average²⁹ in what regards legislation on tobacco advertising (data from January 2011). Furthermore, tobacco firms have been increasing their investment in advertisement, with special focus on young adult smoking (Fraga et al., 2005). Weak legislation on tobacco advertising, combined with the increased investment in marketing, might be supporting a rise in young adult smoking.

iii) Shift in patterns of consumption - Intermittent and social smoking present an increasing trend in the U.S.³⁰ Intermittent smokers are those who, even smoking regularly, do not need to smoke daily³¹ (Husten et al., 1998). Social smokers are a type of intermittent smokers defined as someone who smokes mainly when with people, rather than alone (Moran et al., 2004). According to Hassmiller et al. (2003), younger³² smokers are the most likely group to be intermittent smokers. It is possible then that another reason behind the apparent increase in young adult smoking in Portugal is a rise in the phenomena of intermittent and social smoking.

²⁹ Of 31 European countries

³⁰ Hassmiller et al., 2003.

³¹ This type of smokers might not be characterized by being at the beginning of smoking nor trying to quit: they can sustain this behavior in the long-run (Lantz, 2003).

³² Between 15 and 25 years old

iv) Female Smoking - Nogueira et al. (2011) review on tobacco studies show that smoking rates among Portuguese women exhibit a continuous upward trend, from 5% (1987) to 13% (2010), with higher prevalence in younger ages (14,1%)³³. It is then possible that the high young adult smoking rate in the present research stems from the increasing smoking prevalence in women. Adding up to this, the 2012's female smoking rate roughly doubles to 30%, a result that most likely derives from sample bias.

However, some evidence points to the direction that female smoking rates have been underestimated. Macedo and Precioso (2004) indicate that the 1999 Portuguese NHS did underestimate the smoking prevalence among women; Steptoe et al., 1995 and 2002 found smoking rates among young³⁴ Portuguese females of 38% (1995) and 42% (2002)³⁵.

The evidence collected shows that female smoking rates have not been as low as advocated and, even taking into account the potential bias in the 2012 sample, the high young adult smoking cannot be fully explained by the increase in female smokers.

Policy Implications & Further Research

In this study, five reasons were identified as possible drivers of increased young adult smoking: adolescent smoking, delayed effects of tobacco laws, marketing efforts, growth of the phenomena of intermittent and social smoking and upsurge of female smoking.

The 'Old smokers' probably represent the most difficult group to ever change, even though more than half have tried to quit. This group, however, seems more prone than the 'New smokers' to adjust as a consequence of the Law: 35% confirm a decrease in cigarette consumption and/or attempt to quit due to the 2008 Tobacco Law, whereas only 13% of the

³³ Data from 2005 for women between 15 and 24 years old.

³⁴ Aged between 17 and 30 years old.

³⁵ Ravara et al. (2011) surveyed 1,112 individuals, reaching a smoking rate of 23,5% for women; Carvalho (2012) interviewed 900 individuals, finding a smoking rate among women of 20%.

‘New smokers’ do so. ‘New smokers’, on the other hand, seem more sensitive to price: 75% states that the increase in tobacco prices and/or the current economic crisis has made them decreased their cigarette consumption, compared to only 57% of the ‘Old smokers’. As such, adding up to the large evidence on high price sensitiveness of younger cohorts³⁶, increase in taxation of tobacco product seems to be an effective measure for counteracting smoking among Portuguese young adults, a policy that has not been implemented by the Government, since tobacco real prices have not been increasing (Guindon et al., 2002)

Since tobacco advertisement focused on young adults seem to bear an effect in the decision of starting to smoke, or, at least, engage in social or intermittent smoking (Biener and Albers, 2004), marketing bans should increase and be monitored. According to Moran et al. (2004), more than half of university students smoke mainly in social settings and, therefore, smoking should be limited in those areas.

More research on intermittent and social smoking should be pursued in order to understand whether Portugal is actually facing an increasing trend in such habits. If so, then measures should be taken in order to diminish this rate³⁷. Providing young adults with the information regarding the hazards of occasional smoking might be one of the actions to be taken since those who consider themselves social smokers are less likely to attempt quitting (Moran et al., 2004).

While Cardoso and Plantier (2008) showed evidence of a decrease in smoking prevalence, this study did not. It is possible, then, that the Law only had impact on those who were already smokers, bearing no effect on those who started after its implementation – in fact,

³⁶ Literature review conducted by Wilson, 2012.

³⁷ Even though social smoking is characterized by lower frequency and intensity of tobacco use and less nicotine dependence, it may represent a stage in the uptake of smoking (Moran et al., 2004) and, as such, not free from risks.

none of the ‘New smokers’ smoked before the Law was enacted³⁸. More research is needed in order to disentangle the possible differences between the short and medium-run effects of the smoking ban.

In order to bear the desired effect, according to the WHO (2011), smoking bans should be accompanied with monitoring of tobacco use and prevention, help those who want to quit, display warnings about the dangers of smoking, enforce the bans and increase taxation on tobacco. The Portuguese government seems to be on the right path to fulfill these measures, although still falling behind in some aspects (such as enforcement of marketing bans and increased taxation). Many researchers have proven that smoking bans limit exposure of non-smokers to SHS, and some have shown evidence of tobacco consumption reductions. However, in the particular case of Portuguese young adults, the results of this study suggest that the 2008 Tobacco Law did not have, so far, an impact on smoking rates, let alone counteract the apparent increasing trend.

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³⁸ The distinct impact of the ban on the different cohorts here identify is described by Guerrero et al. (2011), as already mentioned in this study.

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7. APPENDIX

Table 1: *Probit model*

Variable	Coef.	P> z
Male	0.035	0.627
Age*	-0.174	0.000
Portuguese	0.099	0.527
Single	0.036	0.879
Married	-0.019	0.936
Divorced	0.037	0.881
Live conjugally*	-0.447	0.000
No. individuals	7.5e-03	0.709
Yrs schooling	-0.012	0.405
Basic	-0.111	0.471
Secondary	0.063	0.592
Worker	0.115	0.193
Student*	-0.788	0.000
Home maker	0.237	0.171
Retired	-0.129	0.368
i151_200*	0.143	0.026
i1501_2000	-1.54	0.211
Norte	-0.118	0.245
Centro	-0.061	0.566
LVT	0.03	0.761
Alentejo	0.072	0.488
Algarve	-0.076	0.448
Açores	-0.107	0.261
Height	4.7e-04	0.157
Weigh	-2.8e-04	0.307
Insurance*	-0.242	0.006
Diseases 1-2	-0.142	0.206
Diseases > 2	-0.164	0.566
Diabetes	-0.17	0.238
Asthma	6.8e-03	0.962
Hypertension	0.031	0.785
Chronic pain	0.104	0.371
Rheumatic	0.200	0.114
Osteoporosis	0.056	0.800
Glaucoma	-0.360	0.502
Retinopathy	-0.683	0.114
Cancer	-0.021	0.942
Kidney Stone	0.282	0.072
Renal failure	-0.261	0.362
Anxiety	0.104	0.560
Chronic wound	-0.142	0.625
Emphysema	-9.7e-03	0.959
Stroke	0.201	0.361
Obesity	0.021	0.902
Depression*	0.327	0.019
Infarction*	-0.69	0.005
Drugs	-0.118	0.051
Live with smoker*	0.307	0.000
Live with ex-smoker	-0.066	0.303
Years as smoker*	0.176	0.000
Smoke 5 years ago*	2.08	0.000
Constant*	1.14	0.009

Table 2: Types of prediction errors

Reality \ Prediction	Smokers	Non-smokers
Smokers		Type B B1 – 1.63% B2 – 1.13%
Non-smokers	Type A B1 – 5.33% B2 – 71.86%	

Table 3: Types of 2012's smokers

Reality \ Prediction 05	Smokers	Non-smokers
Smokers	Old Smokers	Late Smokers
Non-smokers	Wild Smokers	New Smokers

Table 5: Errors' magnitudes by group

	Type A1	Type B1	Type A2	Type B2
Men	5.64%	1.22%	71.86%	1.13%
Women	5.00%	0.34%	52.80%	1.99%
Lighter	4.88%	0.24%	40.46%	4.44%
Students	6.99%	0.21%	36.30%	2.02%
10-20 yo	0.98%	0.28%	71.23%	0.51%
21-30 yo	0.59%	0.20%	63.74%	0.81%
31-40 yo	0.45%	0.28%	60.32%	0.00%
41-50 yo	4.29%	3.08%	66.00%	2.30%
>50 yo	0.93%	6.28%	73.08%	2.41%
ALL	5.32%	1.63%	71.86%	1.13%

Graph 2: Youth smoking rates

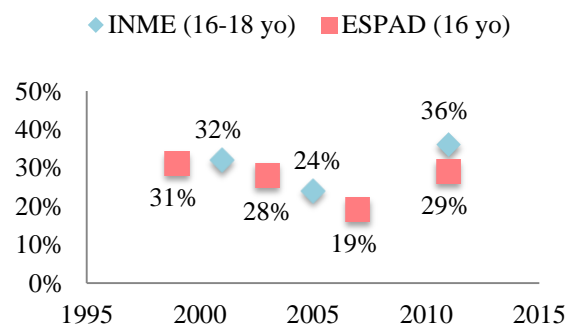


Table 4: Groups' statistics– 'New smokers' | 'Old smokers' | 2012 smokers | 2012 population | 2005 smokers | 2005 population

		2012				2005				2012				2005	
		Variable/Group	New	Old	Smkrs	Pop	Smkrs	Pop		New	Old	Smkrs	Pop	Smkrs	Pop
Marital Status		Age	20.11	28.90	27.32	26.15	40.81	46.39	Insurance	47.54%	46.79%	55.20%	52.13%	8.72%	7.19%
		Male	40.98%	41.67%	42.29%	40.33%	73.94%	47.09%	Disease 1 - 2	25.41%	34.62%	30.65%	27.48%	31.33%	34.99%
	Single		96.72%	72.44%	77.96%	81.50%	33.43%	30.37%	Diseases > 2	1.64%	7.05%	3.76%	2.22%	7.42%	16.15%
	Married		0.00%	14.10%	12.90%	11.52%	56.43%	56.39%	Prescription drugs	49.18%	43.59%	51.08%	51.63%	39.11%	54.68%
	Divorced		2.46%	6.41%	5.20%	3.66%	7.02%	4.14%	Average income [1-10]	8.47	7.97	8.53	8.63	8.43	7.99
	Widowed		0.82%	1.92%	0.90%	0.55%	2.22%	9.10%	Live with smoker	56.56%	66.67%	57.35%	20.00%	44.37%	31.39%
	Other		0.00%	5.77%	3.05%	2.77%	0.00%	0.00%	Live with ex-smoker	37.70%	25.64%	31.36%	13.02%	18.92%	23.30%
House	Live conjugally		10.66%	28.21%	28.14%	21.94%	60.67%	57.72%	No. smokers house	1.98	1.82	1.88	1.83	n.a.	n.a.
	Family		76.23%	64.10%	63.44%	62.16%	n.a.	n.a.	No. ex-smokers house	1.20	1.1	1.14	1.18	n.a.	n.a.
	Partner		1.64%	14.74%	13.62%	15.25%	n.a.	n.a.	Starting age	17.84	14.75	16.83	16.74	17.03	17.01
	Friends		18.03%	9.62%	13.44%	11.94%	n.a.	n.a.	Start before 17 yo	50.82%	91.67%	64.34%	64.88%	62.46%	61.01%
	Alone		0.00%	10.26%	8.60%	9.78%	n.a.	n.a.	Starting [18-24]	46.72%	8.33%	33.69%	33.52%	31.64%	32.98%
	Other		0.82%	1.28%	0.90%	0.86%	n.a.	n.a.	Starting [25-44]	2.46%	0.00%	1.97%	1.60%	5.46%	5.63%
	No. individuals		1.35	1.28	1.30	2.35	3.24	3.51	Starting [45-64]	0.00%	0.00%	0.00%	0.00%	0.41%	0.38%
Education	Years of schooling		13.08	14.00	14.28	14.52	7.98	7.46	Number cigarettes/day	8.58	12.29	10.93	12.23	33.05	34.11
	Basic		2.46%	4.49%	2.87%	1.83%	74.88%	75.80%	Light smoker	77.87%	53.25%	62.41%	57.12%	28.04%	29.75%
	Secondary		20.49%	35.90%	18.82%	14.07%	15.34%	12.46%	Average smoker	14.75%	25.97%	21.04%	20.78%	10.58%	8.57%
	Tertiary		77.05%	59.62%	78.32%	84.10%	9.65%	8.90%	Heavy smoker	7.38%	20.78%	16.55%	22.09%	59.67%	63.39%
Occupation	Worker		9.02%	48.72%	31.00%	26.87%	70.21%	46.97%	Years as smoker	2.26	14.15	10.55	4.33	38.00	9.81
	Student		85.25%	19.87%	50.36%	59.83%	4.23%	13.59%	Attempt to quit	42.62%	54.49%	52.34%	52.15%	45.59%	45.59%
	Home maker		0.00%	3.21%	1.08%	1.00%	3.14%	9.97%	Number of attempts	1.73	1.91	1.81	0.62	n.a.	n.a.
	Retired		0.00%	1.28%	1.43%	0.78%	10.04%	21.81%	Law help quit	n.a.	n.a.	n.a.	71.53%	n.a.	n.a.
	Other		5.74%	26.92%	16.13%	11.52%	12.37%	7.66%	Law help stay quit	n.a.	n.a.	n.a.	62.04%	n.a.	n.a.
Region	Norte		4.10%	7.69%	6.45%	6.20%	13.01%	14.74%	Cessation treatment	0.00%	4.65%	4.47%	4.91%	n.a.	n.a.
	Centro		18.85%	15.38%	14.34%	15.29%	10.31%	14.44%	Feel Law	36.89%	50.00%	45.34%	48.78%	n.a.	n.a.
	LVT		63.11%	69.23%	70.79%	71.58%	15.77%	14.39%	You Law	12.50%	34.58%	28.21%	26.64%	n.a.	n.a.
	Alentejo		10.66%	5.77%	5.91%	3.66%	14.48%	14.09%	Feel crisis	68.03%	76.28%	70.43%	69.50%	n.a.	n.a.
	Algarve		1.64%	0.64%	1.61%	2.05%	16.43%	14.78%	You crisis	75.00%	57.01%	56.41%	43.65%	n.a.	n.a.
	Madeira		1.64%	1.05%	0.90%	0.94%	12.42%	13.05%	Smoke 5 years ago	0.00%	100%	77.96%	26.93%	93.25%	19.26%
	Açores		0.00%	0.00%	0.00%	0.28%	17.59%	14.50%							

**A Work Project, presented as part of the requirements for the Award of a
Master's Degree in Economics from Nova School of Business and Economics from
Universidade Nova de Lisboa**

**2008 PORTUGUESE TOBACCO LAW:
WHAT ARE THE EFFECTS ON
SMOKING RATES?**

SUPPLEMENTARY APPENDIX

Mariana Gameiro 492

**Supervision of:
Professor Pedro Pita Barros**

7 JANUARY 2013

S.Appendix 1: Description of the variables

Name of the variable	Description	Present in surveys
Age	Number of years of the individual.	Both
Male	Binary variable that takes value 1 if the individual is male.	Both
Marital Status variables	Five binary variables: single, married, divorced, widowed, other marital status.	Both
Height & Weight	Height and weight of the individuals in cm and kg, respectively.	Both
Yrs schooling	Number of years of schooling successfully completed by the individuals.	Both
Basic/Secondary/ Tertiary	Binary variables that take value 1 for the highest degree attended (in case individual is still a student), or the highest degree achieved (in case the individual no longer studies).	Both
Region	Seven binary variables representing each one of the Portuguese NUTs: <i>Norte, Centro, Lisboa e Vale do Tejo (LVT), Algarve, Açores, Madeira</i> .	Both
Occupation variables	Five binary variables for: worker, student, home maker, retired and other.	Both
Live conjugally	Binary variable for whether the individual lives conjugally with someone.	Both
House	Five binary variables for whether the individual shares house with family, friends, partner, alone, other.	Only 2012
No. individuals	The number of people the individuals shares house with.	Both
Insurance	Binary variable for whether the individual has health insurance.	Both
Diseases	Fifteen binary variables for whether the individuals present any of the following chronic diseases: diabetes, asthma, hypertension, chronic pain, rheumatic, osteoporosis, glaucoma, retinopathy, cancer (and malignant tumor), kidney stone, kidney failure, anxiety, chronic wounds (bedsores and ulcers), emphysema (and bronchitis), stroke, obesity, depression, infarction, lung cancer (only 2012).	Both
Diseases 1 – 2	Binary variable for whether the individual has one or two chronic diseases.	Both
Diseases >2	Binary variable for whether the individual sums more than two chronic diseases.	Both
Drugs	Binary variable for whether the individual has taken any prescription drugs in the two weeks prior to the survey date.	Both
Income	Ten binary variables representing monthly income brackets, in euros. The name of the variable takes the following form: i[low bound_high bound]. For instance, income between 151 and 200€ per month is i151_200.	Both
Live smoker	Binary variable for whether the individual shares house with a smoker.	Both
Live ex-smoker	Binary variable for whether the individual shares house with an ex-smoker.	Both
No. smokers house	The number of smokers the individual shares house with.	Only 2012
No. ex- smokers house	The number of ex-smokers the individual shares house with.	Only 2012
Starting age	The age at which the smoker or ex-smoker started to smoke. It is also divided into five age cohorts: before 17 years old, between 18 and 24, between 25 and 44, and between 45 and 64.	Both
Number cigarettes/day	Number of cigarettes the smoker or ex-smoker smokes per day. It is also divided into three categories: light smoker (less than 10	Both

	cigarettes per day), average smoker (between 11 and 19 cigarettes per day), heavy (more than 20 cigarettes per day).	
Years as smoker	The number of years during which the individual has smoked for.	Both
Attempt to quit	Binary variable for whether the individual has made an attempt to quit smoking.	Both
Number of attempts	Number of times the individual has tried to quit	Only 2012
Law help quit	Binary variable for whether the ex-smoker feels that the 2008 Tobacco law help him/her quit.	Only 2012
Law help stay quit	Binary variable for whether the ex-smoker feels that the 2008 Tobacco law help him/her stay quit.	Only 2012
Cessation appointment	Binary variable for whether the individual used any smoking cessation service.	Only 2012
Feel Law	Binary variable for whether believes that the Law has had a negative impact on smoking behaviour of the population.	Only 2012
You Law	Binary variable for whether believes that the Law has had a negative impact on his/her own smoking behaviour.	Only 2012
Feel crisis	Binary variable for whether believes that the current economic crisis has had a negative impact on smoking behaviour of the population.	Only 2012
You crisis	Binary variable for whether believes that the current economic crisis has had a negative impact on his/her own smoking behaviour.	Only 2012
Smoke 5 years ago	Binary variable for whether the individual was a smoker five years prior to the survey date.	Both

S.Appendix 2: 2012 Survey – Portuguese | **English:**

Q1 Sexo | **Gender**

- ☐ Feminino | **Female**
- ☐ Masculino | **Male**

Q2 Idade/**Age**

Q3 Nacionalidade | **Nationality**

- ☐ Portuguesa | **Portuguese**
- ☐ Portuguesa + Outra | **Portuguese + Other**
- ☐ Outra nacionalidade que não portuguesa | **Another nationality rather than Portuguese**

Q4 Estado Civil/ **Marital Status**

- ☐ Solteiro/a | **Single**
- ☐ Casado/a | **Married**
- ☐ Divorçado/a | **Divorced**
- ☐ Viúvo/a | **Widowed**
- ☐ Outro | **Other**

Q5 Vive conjugalmente com alguém? | **Do you live conjugally with someone?**

- ☐ Sim | **Yes**
- ☐ Não | **No**

Q6 Qual o nível mais elevado que frequenta ou, se já não estuda, frequentou? | **Which is the highest level that you have attended or are currently attending?**

- ☐ Ensino básico ou menor (até 9º ano) | **Basic education or lower**
- ☐ Ensino secundário (10º, 11º e 12º ano e cursos técnico-profissionais) | **Secondary education or Vocational Education**
- ☐ Ensino superior (Licenciatura, Mestrado, Doutoramento) | **Higher Education**

Q7 Quantos anos de escolaridade completou com aproveitamento? | **How many successful years of schooling have you completed?**

Q8 Qual dos seguintes descreve melhor a sua principal ocupação? | **Which one of the following better describes your occupation?**

- ☐ Trabalhador, mesmo que não remunerado para uma pessoa de família | **Worker**
- ☐ Estudante | **Student**
- ☐ Tarefas domésticas | **Home maker**
- ☐ Reformado | **Retired**
- ☐ Outro | **Other**

Q9 Quantas horas trabalha por SEMANA? (por favor, indique um número entre 1 e 90) | **How many hours do you work per week ? (number between 1 and 90)**

Q10 O local onde trabalha tem sala de fumadores? | **In your workplace, do you have smokers' room?**

- ☐ Sim | **Yes**
- ☐ Não | **No**

Q11 Em que região de Portugal vive? | **In which region of Portugal do you live?**

- ☐ Norte
- ☐ Centro
- ☐ Lisboa e Vale do Tejo
- ☐ Alentejo
- ☐ Algarve
- ☐ Açores
- ☐ Madeira

Q12 Qual é a sua altura, em cm? | **What is your height, in cm?**

Q13 Qual é o seu peso, em kg? | **What is your weight, in kg?**

Q14 Tem seguro de saúde? | **Do you have health insurance?**

- ☐ Sim | **Yes**
- ☐ Não | **No**
- ☐ Não sabe | **Does not know**

Q15 Tem ou já teve alguma das seguintes doenças crónicas? (Pode escolher mais que uma opção) | **Do you have or had any of the following chronic diseases?**

- ☐ Diabetes | **Diabetes**
- ☐ Asma | **Asthma**
- ☐ Hipertensão | **Hypertension**
- ☐ Dor crónica (dor constante ou repetitiva durante, pelos menos, três meses) | **Chronic pain**
- ☐ Doença reumática | **Rheumatic**
- ☐ Osteoporose | **Osteoporosis**

- ☐ Glaucoma | **Glaucoma**
- ☐ Retinopatia (doença da retina) | **Retinopathy**
- ☐ Tumor maligno ou cancro | **Cancer**
- ☐ Pedra nos rins | **Kidney stone**
- ☐ Insuficiência Renal | **Kidney failure**
- ☐ Ansiedade crónica | **Chronic anxiety**
- ☐ Ferida crónica (úlceras da perna, escaras) | **Chronic wound (ulcers, bedsores)**
- ☐ Enfisema (doença pulmonar obstrutiva crónica), Bronquite crónica | **Emphysema, Bronchitis**
- ☐ AVC | **Stroke**
- ☐ Obesidade | **Obesity**
- ☐ Depressão | **Depression**
- ☐ Enfarte do miocárdio | **Infarction**
- ☐ Nenhuma doença ou nenhuma das anteriores | **No chronic disease or none of the above**

Q16 Tem cancro do pulmão? | **Do you have lung cancer?**

- ☐ Sim | **Yes**
- ☐ Não | **No**

Q17 Nas últimas DUAS SEMANAS tomou medicamentos receitados pelo médico (incluindo pílulas contraceptivas ou outras hormonas, pomadas, cremes, injeções, vacinas)? | **In the last two weeks, have you taken any prescription drugs? (including contraceptive pill or other hormones, ointments, creams, injections, vaccines)**

- ☐ Sim | **Yes**
- ☐ Não | **No**

Q18 Que intervalo se aproxima mais ao rendimento mensal da sua família? | **Which income interval is closer to the monthly income of your household?**

- ☐ Menos de 150€ | **Less than 150€**
- ☐ Entre 151€ e 250€ | **Between 151€ and 250€**
- ☐ Entre 251€ e 350€ | **Between 251€ e 350€**
- ☐ Entre 351€ e 500€ | **Between 351€ e 450€**
- ☐ Entre 501€ e 700€ | **Between 501€ e 700€**
- ☐ Entre 701€ e 900€ | **Between 701€ e 900€**
- ☐ Entre 901€ e 1200€ | **Between 901€ e 1200€**
- ☐ Entre 1201€ e 1500€ | **Between 1201€ e 1500€**
- ☐ Entre 1501€ e 2000€ | **Between 1501€ e 2000€**
- ☐ Mais de 2000€ | **More than 2000€**
- ☐ Não sabe | **Does not know**

Q19 Fuma? | **Do you smoke?**

- ☐ Sim | **Yes**
- ☐ Ocasionalmente | **Occasionally**
- ☐ Não | **No**

Q20 Quantos cigarros fuma, habitualmente, por dia? | **How many cigarettes do you smoke, on average, per day?**

Q21 Desde que idade fuma? | **Since when do you smoke?**

Q22 Há dois anos (2010), fumava menos, o mesmo ou mais? | **Two years ago (2010), did you smoke less, the same, or more?**

- ☐ Fumava menos | **Less**
- ☐ Fumava o mesmo | **The same**
- ☐ Fumava mais | **More**

Q23 Alguma vez fumou? | **Have you ever been a smoker?**

- ☐ Diariamente | **Daily**
- ☐ Ocasionalmente | **Occasionally**
- ☐ Não | **No**

Q24 Quantos cigarros fumava, em média, por dia? | **How many cigarettes, on average, did you use to smoke?**

Q25 Com que idade começou a fumar? | **How old were you when you started to smoke?**

Q26 Com que idade parou de fumar? | **How old were you when you stopped smoking?**

Q27 Já alguma vez tentou parar de fumar? | **Have you ever tried to quit smoking?**

- ☐ Sim | **Yes**
- ☐ Não | **No**

Q28 Quantas vezes tentou parar de fumar até agora? | **How many times have you tried?**

- ☐ Uma vez | **Once**
- ☐ Duas a três vezes | **Twice to three times**
- ☐ Mais de três vezes | **More than three times**

Q29 Qual a principal razão para ter deixado de fumar/ tentado parar de fumar? | **Which one is the main reason that made you stop/try to stop smoking?**

- ☐ Não gostar do cheiro do fumo | **Did not like the smell of smoke**
- ☐ Medo de problemas de saúde | **Affraid of health problems**
- ☐ Falta de dinheiro | **Lack of money**
- ☐ Deixei de gostar | **Stopped enjoying it**
- ☐ Conselho de médico | **Doctor's advice**
- ☐ Não gostava da dependência do tabaco | **Did not like to be tobacco dependent**
- ☐ Por conhecer doentes devido a tabaco | **Because I know sick people due to tobacco smoking**
- ☐ Devido ao aumento do preço do tabaco | **Due to the increase of tobacco prices**
- ☐ Outro | **Other**

Q30 Sente que a Lei do Tabaco que desde 2008 proíbe fumar em locais públicos (faculdade, bares, cafés, restaurantes, hospitais, etc.) o ajudou a deixar de fumar? | **Do you feel that the 2008 Tobacco Law that forbids smoking in public places (university, bars, cafes, restaurants, hospitals, etc.) help you quit smoking?**

- ☐ Sim | **Yes**
- ☐ Não | **No**

Q31 Sente que a Lei do Tabaco que desde 2008 proíbe fumar em locais públicos (faculdade, bares, cafés, restaurantes, hospitais, etc.) o ajudou a continuar a não fumar? | **Do you feel that**

the 2008 Tobacco Law that forbids smoking in public places (university, bars, cafes, restaurants, hospitals, etc.) help you stay quit?

- ☐ Sim | **Yes**
- ☐ Não | **No**

Q32 Foi a alguma consulta de cessação? | **Did you go to a smoking cessation appointment?**

- ☐ Sim | **Yes**
- ☐ Não | **No**

Q33 Mora com: (Caso tenha mudado de casa nos últimos dois anos, baseie as suas respostas na casa onde morou a maior parte do tempo durante esse período) | **You share house with: (In case you have changed the place you live in the last two years, please consider the place where you have lived most of the time when answering the following questions)**

- ☐ Família | **Family**
- ☐ Companheiro/a | **Partner**
- ☐ Amigos/Colegas | **Friends/Colleagues**
- ☐ Sozinho | **Alone**
- ☐ Outro | **Other**

Q34 Com quantas pessoas mora? | **With how many people do you share house with?**

Q35 Na casa onde mora a maior parte do tempo, alguém é fumador? | **Do you live with smokers?**

- ☐ Sim | **Yes**
- ☐ Não | **No**

Q36 Quantas pessoas fumam na casa onde mora a maior parte de tempo? | **How many smokers live in your house?**

Q37 Na casa onde mora a maior parte do tempo, alguém já foi fumador e deixou? | **Do you live with ex-smokers?**

- ☐ Sim | **Yes**
- ☐ Não | **No**
- ☐ Não sabe | **Does not know**

Q38 Quantas pessoas que moram em sua casa já foram fumadoras e deixaram de fumar? | **How many ex-smokers live in your house?**

Q39 Sente que a Lei do Tabaco que desde 2008 proíbe fumar em locais públicos (faculdade, bares, cafés, restaurantes, hospitais, etc.) fez com as pessoas, no geral, fumem menos? | **Do you feel that the 2008 Tobacco Law that forbids smoking in public places (university, bars, cafes, restaurants, hospitals, etc.) has made people smoke less?**

- ☐ Sim | **Yes**
- ☐ Não | **No**

Q40 No seu caso específico, a Lei do Tabaco de 2008 fez com que fumasse menos/parasse de fumar/tentasse parar de fumar? | **Do you feel that the 2008 Tobacco Law that forbids smoking in public places (university, bars, cafes, restaurants, hospitals, etc.) has made you smoke less/quit smoking/try to quit?**

- ☐ Sim | **Yes**

○ Não | No

Q41 Sente que o aumento do preço do tabaco e/ou a atual crise têm vindo a fazer com que as pessoas cada vez fumem menos? **Do you feel that the increase in tobacco prices and/or the current economic crisis has made has made people smoke less?**

S.Appendix 3: Marginal effects of *probit* model

VARIABLE	COEFFICIENT	VARIABLE	COEFFICIENT
Male	7.30e-07	Diseases 1-2	-3.96e-06
Age	-2.60e-06	Diseases > 2	-3.12e-06
Portuguese	1.59e-06	Diabetes	-2.83e-06
Single	-5.41e-07	Asthma	-2.42e-07
Married	-4.46e-06	Hypertension	4.35e-07
Divorced	-2.53e-06	Chronic pain	2.48e-06
Live conjugally	-.0000169	Rheumatic	6.49e-06
No. individuals	1.58e-07	Osteoporosis	1.27e-06
Yrs schooling	-2.54e-07	Glaucoma	-4.72e-06
Basic	-8.87e-07	Retinopathy	-5.12e-06
Secondary	2.78e-06	Cancer	-6.59e-07
Worker	2.12e-06	Kidney Stone	.0000112
Student	-6.77e-06	Renal failure	-4.10e-06
Home maker	.0000107	Anxiety	2.20e-06
Retired	7.32e-06	Chronic wound	-1.46e-06
i151_200	4.23e-06	Emphysema	6.27e-07
i1501_2000	-5.19e-06	Stroke	.0000143
Norte	-2.59e-06	Obesity	2.53e-07
Centro	-1.20e-06	Depression	.0000117
LVT	6.11e-07	Infarction	-5.19e-06
Alentejo	1.49e-06	Drugs	-2.86e-06
Algarve	-1.84e-06	Live with smoker	.0000103
Açores	-2.19e-06	Live with ex-smokr	-1.71e-06
Height	9.78e-09	Years as smoker	4.26e-06
Weight	-5.55e-09	Smoke 5 years ago	.0016905
Insurance	-3.96e-06		

S.Appendix 4: Comparison between the variables of the model and the literature

The survey was constructed based on works from Hymowitz et al. (1997), Tauras and Chaloupka (1999); Jarallah et al. (1999); Pomerleau et al. (2004); Viscusi et al. (2000); Monden et al. (2003); Biener et al. (2010) and Anger et al. (2010). The following table compares the significance and signs of some variables used in the model with the collected literature.

S.Appendix 5 describes succinctly the data and methodology applied in each study.

Variable	Significant in model of study?	Significant in other models?	Sign	References
Male	NO	YES	Positive	Pomerleau et al. (2004); Viscusi et al (2000); Jarallah et al. (1999).
Age	YES	YES	Negative	Pomerleau et al. (2004); Jarallah et al. (1999).
Married	NO	YES	Negative /Positive	Pomerleau et al. (2004); Jarallah et al. (1999).
Education	NO	YES/NO	Positive/ Negative	Pomerleau et al. (2004); Viscusi et al (2000); Jarallah et al. (1999).
Income	NO	YES	Positive/ Negative	Pomerleau et al. (2004); Jarallah et al. (1999).
Live with smoker	YES	YES	Positive	Monden et al. (2003).

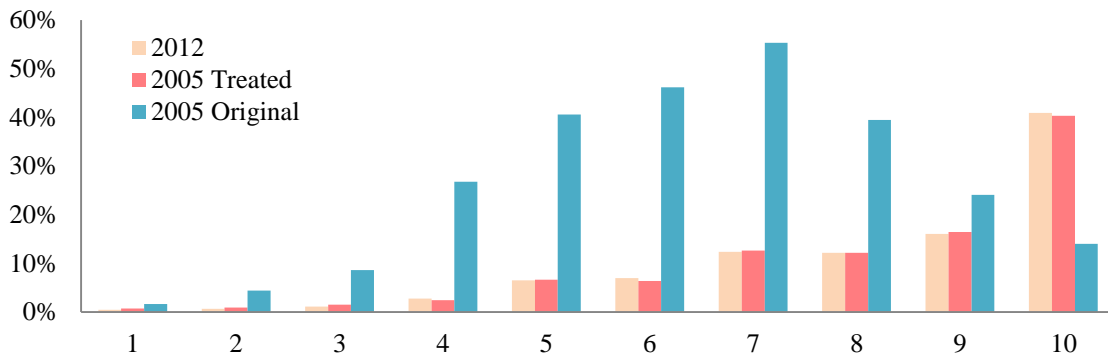
S.Appendix 5: Description of Data & Methodology

Paper	Data & Methodology
Jarallah et al. (1999)	Household survey to 8,310 individuals in Saudi Arabia. <i>Logistic</i> models for smoker.
Monden et al. (2003).	Analysis of the Netherlands Health Interview Survey between 1989 e 1996. <i>Logistic</i> models for smokers.
Pomerleau et al. (2004)	Household survey to 18,428 in eight former Soviet Union countries. <i>Logisitc</i> models for smoker by gender.
Viscusi et al (2000)	2,571 phone interviews in Spain. <i>Probit</i> models for smoker.

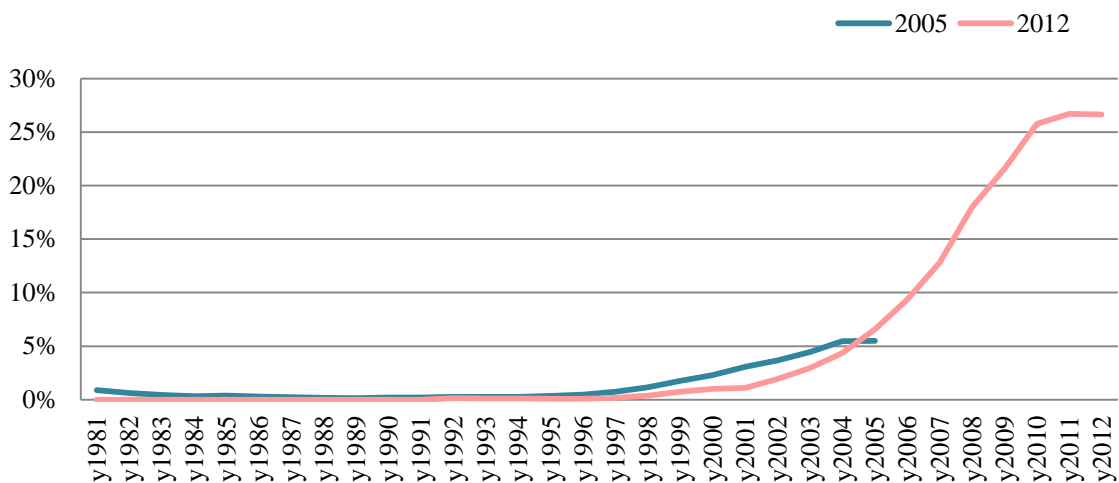
S.Appendix 6: Share of smokers per region

Region	% Smokers 2005	Number Individuals 2012	% Smokers 2012	% 'New smokers'
<i>Norte</i>	15.70%	112	32.14%	13.80%
<i>Centro</i>	12.69%	276	28.99%	28.75%
<i>LVT</i>	19.48%	1292	30.57%	19.49%
<i>Alentejo</i>	18.27%	66	50.00%	39.39%
<i>Algarve</i>	19.76%	37	24.32%	22.22%
<i>Açores</i>	21.57%	5	0.00%	0.00%
<i>Madeira</i>	16.92%	17	29.41%	22.22%

S.Appendix 7: Student's income distribution for 2005 and 2012



S.Appendix 8: Smoking rate per year - Students



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